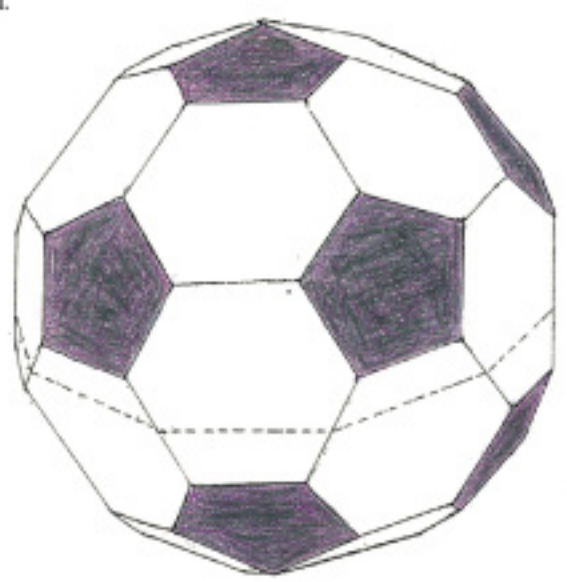
I meditated on the football and conceived the term Hexpenhedron for the truncated icosahedron

Consider the popular football. I was struck by the perfect geometric symmetry of the "hexagon-pentagon" complex design on it. On reflection I must state that the geometric symmetry I refer to is actually a sphero-geometric symmetry, because the geometric figures are drawn on a spherical surface. The design is composed of 12 equal arced pentagons and 20 equal arced hexagons, all of them having 90 arced sides of equal length, which meet at 60 arced vertices. Each vertex consists of 3 arced apices, 2 from hexagons and 1 from a pentagon. I thought that if the whole complex was superimposed onto the earth, the sides could give instant measurements of distances and the pentagons and hexagons could give instant measurements of areas. But due consideration will have to be given to the earth's oblate-spheroid shape. With this objective in mind I decided to map out the entire "hexagon-pentagon" complex design of the football in the same way I plotted the antipodes map – by using coordinates and the circular geographical "latitude-longitude" graph. I decided to have the pentagons sited at the poles. I had to equip myself for the task by determining firstly the basic length of a side or arc of the sphero-geometric figures. This was solved simply by noting that an imaginary equator could be divided into 10 equal lengths by the 10 hexagons it goes through. I based my calculations on this fact.

The Hexpenhedron.



I decided to call it the hexpenhedron because it is composed of hexagons and pentagons from my meditating on the design of the football. It is shown above. It is as if the spherical football had its arced hexagons and pentagons shaved off, leaving the flat hexagons and pentagons over which the arced ones were resting, vertex over vertex. Thus the sphere is reduced to a composite polyhedron called the hexpenhedron. It has 32 faces (20 equal hexagons and 12 equal pentagons), 90 sides of equal length and 60 vertices. Each vertex is made up of 3 apices, 2 from hexagons and 1 from a pentagon. Although the hexpenhedron is not a regular polyhedron it shares two common characteristics of all regular polyhedra – it also has sides of uniform length and can be enclosed or insphered within a sphere, with its vertices just touching the sphere. The hexpenhedron shown above can be imagined to be insphered within the football (top diagram). Thus, a light at the centre could radiate and project the faces, sides and vertices of the insphered hexpenhedron onto the surface of the sphere. Hence the design of the football could actually be the projected image of the hexpenhedron. Note the course of the imaginary equator over the faces of the hexagons.